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Packaging

The invention relates to a plastics package of the type stated in the introductory portion of claim 1, wherein a 5 snap engagement is provided during the application of a lid to a container. Such a package is known e.g. from US Patent No. 5 143 219.

There is a need for providing a low-cost package that is 10 suitable for the transport of e.g. inflammable liquids. In particular, there is a need for such a package as can meet the strict demands made by the UN with respect to density, both at an internal positive pressure of 1 bar liquid pressure and 0.4 bar gas pressure as well as after 15 a drop test where the lid of the package is affected by a concentrated external impact. Even though for years numerous attempts have been made at providing such packages of plastics (see e.g. US Patent No. 5 163 576), so far it has nevertheless been necessary to resort to metallic 20 packages in practice to ensure reliable properties. It has thus been observed that the radial expansion of the known plastics containers combined with the tendency of the plastics layer to bulge upwards during relatively low internal pressures has given rise to release of the snap 25 engagement, so that the mentioned UN specifications cannot be met.

The invention has made it possible to provide a low-cost 30 package which can be made of a plastics material in a simple manner, and which meets the mentioned specifications.

This is achieved as stated in claim 1, wherein, during the establishment of a snap engagement between the lid

and the container of the package, first a compression and then a partial relief of a sealing member embedded between the lid and the container are provided. This greatly obviates the situation that an internal pressure 5 in the container and an external impact can cause the snap engagement to be released. When preferably the lid and the container are formed with inclined cooperating engagement faces, a particularly simple structure is achieved.

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As stated in claim 5, the sealing member is preferably arranged in the lid, whereby damage to the sealing member during the application of the lid to the container is avoided to the greatest extent possible.

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When the package is formed so as to provide a ring-shaped space, as stated in claim 6, a particularly effective sealing of the package is achieved.

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The invention moreover relates to a lid for a container for providing a package of the type stated initially. The invention also relates to an expedient mould for the manufacture of the lid.

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The invention will now be explained more fully with reference to the embodiment shown in the drawing. In the drawing:

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fig. 1 shows a portion of a package according to the invention, seen in cross-section,

fig. 2 shows the lid shown in fig. 1 for the package,

fig. 3 shows the container shown in fig. 1 for the package, and

5 fig. 2 using a mould according to the invention.

In fig. 1, the reference numeral 1 generally designates a package consisting of a container 30 with an applied lid 10. The container 30 and the lid 10 extend symmetrically around an axis of symmetry CL. Both the container 30 and the lid 10 are made of a plastics material by moulding.

As mentioned initially, there is a need for providing a low-cost package which is suitable for the transport of inflammable liquids among other things. In particular, there is a need for such a package as can meet the strict requirements made by the UN with respect to density, both at an internal positive pressure of 1 bar liquid pressure and 0.4 bar gas pressure as well as after a drop test. Even though for years numerous attempts have been made at providing such packages of plastics, so far it has nevertheless been necessary to resort to metallic packages in practice to ensure reliable properties.

25 The shown container 30 is formed by a cylindrical wall 32 which, at its lowermost end, is connected with a bottom (not shown) for the container. Opposite the bottom, the wall 32 has an annular free edge 35. Outermost, the lid 10 has a skirt 14 which forms a downwardly open reception 30 channel. When the lid 10 is applied to the container 30, the free edge 35 is moved into the reception channel until a position in which a snap engagement is established between the lid 10 and the container 30 by snap action. The snap engagement causes an engagement face 29 on the

lid 10 to engage a complementary engagement face 42 on the container 30, which provides an effective fixing of the lid 10 on the container 30. To allow subsequent emptying of the package 1, the lid 10 may be formed with a 5 separate opening.

As shown in fig. 1, the package 1 also comprises an annular elastic sealing member 23. When the snap engagement has been established between the lid 10 and the container 10 30, the sealing member 23 engages the bottom wall 19 of the reception channel of the lid 10 with a certain bias and engages an outwardly extending annular rib 31 on the outer side of the wall 32. A ring-shaped space 5 is provided outermost between the rib 31 and the skirt 14, said 15 space having a radial extent which decreases in a direction away from the sealing member 23, as shown.

Fig. 2 shows the lid 10 alone. It will be seen that the lid 10 comprises a face portion 12 connected with said 20 skirt 14. As mentioned, the skirt 14 forms the reception channel, which is indicated by the reference numeral 15, of the lid, said skirt 14 comprising a first side wall 17, a second side wall 25 and the bottom wall 19. The first side wall 17 is connected with the face portion 12 25 via an annular wall 11, and this connection is stiffened by means of ribs 13 which are directed radially from the axis CL and are arranged at a mutual distance around the axis CL. The second side wall 25 has a free end with an end face 28 extending obliquely in a direction up toward 30 the face portion 12.

The lid 10 moreover has engagement means 27 arranged on the second side wall 25 in the vicinity of the end face 28. As shown, the engagement means 27 consist of a plane

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annular engagement face 29 which extends obliquely relative to the axis of symmetry CL at an angle α . The angle α is preferably between about 15° and about 40°, preferably about 30° relative to a normal to the axis CL. An 5 inclined face 26 connects the engagement face 29 with the end face 28.

It will moreover be seen that an annular projection 21 is arranged on the bottom wall 19. A groove-shaped depression is defined between the projection 21 and the second 10 side wall 25, as shown, said depression forming a face 20 in which the sealing member 23 is embedded. The sealing member 23 is preferably made of synthetic rubber.

15 Fig. 3 shows a portion of the container 30 according to the invention. Outermost on the wall 32, at a short distance below the free end 35, there is arranged an engagement portion which is generally designated by the reference numeral 40, and which is formed to establish a tight 20 and reliable snap engagement with the lid 10. The engagement portion 40 comprises the above-mentioned rib 31 and an underlying annular rib 41. The two ribs 31, 41 are interconnected by radially directed ribs 44 arranged at a mutual distance around the axis CL. The upper rib 31 has 25 an outer plane end edge 37 which preferably extends at an angle of about 5° relative to the axis CL, and an upper projection 39 arranged on the face 38 which defines the upper side of the rib 31. This angle may e.g. be selected to be between about 3° and about 15°. The function of the 30 projection 39 will be explained more fully below.

As will be seen, the rib 41 is formed on the underside with a plane annular engagement face 42 which extends obliquely relative to the axis of symmetry CL at an angle

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α, i.e. in parallel with the engagement face 29 on the lid 10. The engagement face 29 preferably has such a shape and dimension that it can engage the engagement face 42 over its entire area once the snap engagement has 5 been established.

It will be appreciated that by application of the lid 10 to the container 30 the second side wall 25 will be deformed elastically radially outwards, while the inclined 10 face 26 is moved along the ribs 31, 41 and 44. During this, compression of the sealing member 23 is provided. When the second side wall 25 then bends back to the starting portion, at the moment when the inclined face 26 moves past the rib 41 on the container 30, said snap 15 engagement is established, while relief of the sealing member takes place simultaneously because of the shape of the engagement faces 29, 42, when the lid subsequently moves slightly upwards during the short movement of the engagement face 29 on the engagement face 42. In this position, the sealing member 23 engages both the face 20 on the lid 10 and the face 38 on the rib 31, as shown in fig. 1, and the projection 39 will moreover provide a localized annular deformation of the sealing member 23. This deformation causes part of the sealing member 23 to 25 be pressed into the ring space 5 between the end edge 37 of the rib 31. Since the ring space 5 is wedge-shaped, preferably because of the oblique extent of the end edge 37 relative to the vertical axis CL, additional compression of the part of the material of the sealing member 23 30 that is pressed into the ring space 5 is achieved, which results in an increase in the sealing properties of the package.

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It will be appreciated that the cooperating annular engagement faces 29, 42 are preferably plane; however, nothing prevents the engagement faces from bulging upwards.

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Fig. 4a shows a portion of a mould for use in the manufacture of the lid for the package described above. The mould comprises a female mould part 100, a male mould part 110 and an ejector ring 120 that surrounds the male mould part 110. These mould parts together define a mould cavity for the lid 10 into which a plastics moulding material is injected by means of devices not shown. The ejector ring 120 has a surface portion 122 which forms a moulding face for the inclined end face 28 of the lid during moulding. The male mould part 110 moreover has a recess 112 for providing the engagement face 29 of the lid 10.

Figs. 4b - 4d show how the moulded lid is pressed out of the male mould part 110. The female mould part 100 is first removed as shown in fig. 4b, following which the ejector ring 120 is moved vertically upwards in the direction of the arrow P as shown in fig. 4c, so that the surface portion 122 moves along the inclined end face 28. 25 This upwardly directed movement of the ejector ring 120 gives rise to an outwardly directed force on the finished lid 10, causing the second end wall 25 of the skirt to yield outwards, so that the engagement face 29 clears the recess 112, and so that the lid may then be pressed out 30 of the male mould part 110 by a continued upward movement of the ejector ring 120.

Example:

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A package of the type described above with reference to the drawing was manufactured. The container had a diameter of 30 cm and a height from the bottom to the free edge 35 of 40 cm. The wall thickness of the container was 5 0.2 cm and the thickness of the lid was 0.2 cm. The package was made of HDPE, and a sealing member made of DURO-TAK H2036E manufactured by National Starch & Chemical AB, of Sweden, was selected. The ribs 31 and 41 had a thickness of 0.1 and 0.2 cm, respectively, and the angle α of 10 the face 29 and 42 was selected to be 22°.

By application of an inner positive air pressure of 0.4 bar and an internal liquid pressure of 1 bar a sufficient density was observed to meet UN standard No. 1H2/Y/100/-. 15 The package was likewise able to withstand the drop test described in the same standard.

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